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An Investigation of the Impact of Posttraumatic Stress Disorder on Physical Health

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In a large sample of Gulf War veterans (N = 2301) we examined the relations between PTSD symptoms assessed immediately upon returning from the Gulf War and self-reported health problems assessed 18–24 months later. PTSD symptomatology was predictive of self-reported health problems over time for both men and women veterans, even after the effects of combat exposure were removed from the analysis. Female veterans reported significantly more health problems than male veterans, however, there was no interactive effect of gender and PTSD on health problems. These findings provide further support for the theory that psychological response to stressors impacts health outcome.

KEY WORDS: PTSD; health; gender; Gulf War.

Although the negative impact of traumatic events (such as combat exposure, sexual assault, severe accidents, or natural disasters) on psychological functioning has been well-established (e.g., McFarlane, 1990; Kilpatrick, Edmunds, & Seymour, 1992; Norris, 1992), recent research suggests that trauma may have deleterious effects on physical functioning as well (Wolfe, Schnurr, Brown, & Furey, 1994). For example, the experience of trauma has been associated with increased self-reports of health problems (e.g., Litz, Keane, Fisher, Marx, & Monaco, 1992; Ullman & Siegel, 1996), objective assessments of increased medical problems

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such as cardiovascular disease (e.g., Falger et al., 1992), increased medical utilization (e.g., Kimerling & Calhoun, 1994), and mortality (Friedman & Schnurr, 1995). This suggests that trauma may result in an even greater cost to both the individual and the health care system in general than previously suspected.

Some research indicates that the relationship between traumatic experiences and health problems is partly mediated by the level of posttraumatic stress disorder (PTSD) symptomatology, as opposed to aspects of the traumatic experience or physical injury specifically (Friedman & Schnurr, 1995). For example, Wolfe, Schnurr, Brown, and Furey (1994) examined the relations between PTSD, degree of war-zone exposure, and self-reported health outcomes among a sample of 109 female Vietnam veterans. Using multiple regression analyses, both war-zone exposure and PTSD were positively associated with self-reported health outcomes when predictor variables were analyzed separately. However, when these predictors were used simultaneously, only PTSD significantly predicted self-reported health problems.

To examine more directly the mediational role of PTSD in health outcomes, these same data were reanalyzed using a path analytic procedure by Friedman and Schnurr (1995). In this analysis, although war-zone exposure had a significant total effect on self-reported health outcomes, this was largely attributable to the significant mediational role of PTSD, rather than the direct effects of exposure. The independent influence of PTSD on health outcomes has been confirmed by others (e.g., Nadig, King, & King, 1994).

To date, the majority of studies relating PTSD to health problems have been retrospective or cross-sectional in nature, greatly limiting interpretations of the causal role of PTSD on health problems. Only two longitudinal studies have investigated the relationship between traumatic stressors and self-reported health outcomes (Kimerling & Calhoun, 1994; Schnurr, Spiro, Aldwin, & Stukel, 1998). Kimerling and Calhoun (1994) compared women who had experienced sexual assault to an age-matched comparison group over a 1-year period. Results showed that assault victims consistently reported more frequent and severe somatic symptoms than the control group, and this pattern persisted throughout the follow-up. Schnurr et al. (1998) examined the relations between exposure to traumatic events and physical problems over three decades, among a large sample of male veterans, as part of the Boston VA Normative Aging Study. Veterans who reported experiencing both combat-related traumatic experiences and non-combat-related stressors reported a significant increase in reported health problems over time, however, the experience of either type of stressor alone did not result in an increase in reported health problems. Neither study examined the impact of PTSD symptoms on health problems, however.

Other studies have been limited by their exclusive focus on men or women; thus the role of gender in the relationship between PTSD and health problems has not been explored. There are a numerous reasons why the examination of

gender in this relationship is important (Wolfe & Kimerling, 1996). Preliminary evidence suggests that in comparison to men, women in general are at greater risk for developing PTSD (e.g., Breslau, Davis, Andreski, & Peterson, 1991; Breslau & Davis, 1992; Breslau, Davis, Peterson, & Schultz, 1997; Cottler, Compton, Mager, Spitznagel, & Janca, 1992; Kessler et al., 1995). Relatedly, studies suggest that women are exposed to different types of traumas than men (e.g., women report substantially higher rates of sexual assault) and that they may be at differential risk for developing PTSD in response to specific types of traumatic stressors (Breslau et al., 1998; Norris, 1992). In addition, women have been found to report higher rates of health problems and are diagnosed more often with health problems than men, even in nontraumatized populations (e.g., Verbrugge, 1985, 1989). Finally, there is some evidence that the experience of stress (PTSD symptoms were not assessed directly in these studies) is more predictive of health problems in women than men (Wohlgemuth & Betz, 1991). Taken together, these studies suggest that women may be at greater risk for health problems in general and that gender may be a factor in the relationship between PTSD and health problems.

The current study is an investigation of the relationship among PTSD symptomatology, gender, and self-reported health problems. This study will build on previous studies by examining the relationship between PTSD at one point in time and self-reported health problems up to 2 years later. These variables are evaluated in a cohort of Gulf War veterans. This project is part of the Ft. Devens Operation Desert Storm (ODS) Reunion Survey, an ongoing, longitudinal project involving approximately 3000 Army personnel who were deployed to the Gulf from the New England area in 1991 (Wolfe, Brown, & Kelley, 1993). The hypotheses tested in this investigation were the following: (1) PTSD symptomatology assessed at the point of returning from the Gulf War would predict health problems reported 2 years later, and (2) more health problems would be reported by women than by men 2 years after return. The moderating effect of gender on the association between PTSD symptoms and self-reported health problems was also examined, however, no specific predictions were made since little is known about the differential effects of war and combat experiences on men and women. Examination of certain medical conditions, environmental exposures, and/or other possible predictors of increased health problem reports in Gulf War veterans are the foci of several concurrent analyses and of ongoing investigations of this cohort.

Method

Overview

The Ft. Devens ODS Reunion Survey was designed to measure war stressors and their effects on U.S. soldiers of the Gulf War. Participants were a cohort of

U.S. Army Active, Reserve and National Guard Gulf War veterans ($n = 2949$) who returned to the United States through Fort Devens, MA. This cohort represents approximately 60% of the entire military personnel who returned through Ft. Devens from the Gulf theater. Surveys were administered as part of the routine outprocessing activities. Review of nonsurveyed units indicated random absence for general administrative reasons and unavailability due to competing responsibilities; there is no reason to believe that those veterans who participated in the survey differed on any of the variables of interest from those who did not (Wolfe, Keane, & Young, 1996; Wolfe, Proctor, Davis, Borogs, & Friedman, 1998). An initial survey was conducted within 5 days of return to this country in April 1991, before soldiers rejoined their families (approximately 1–2 months after the end of the Gulf War). The assessment included a 45-min paper-and-pencil survey that measured soldiers' background characteristics, degree of combat exposure, novel war-zone stressors, coping, and psychological outcome. The full cohort (the original 2949 participants) was recontacted for a follow-up survey in 1992–1993. This survey was conducted primarily by mail and, in addition to including many of the original measures, also assessed personal reports of current health problems and health symptoms. Specific measures are described below.

Participants

The veterans in the full cohort ($N = 2949$) were primarily male (91.8%), Caucasian (82.8%), and served in the National Guard (51.6%). This cohort differed somewhat demographically from the U.S. Gulf force as a whole ($n = 696{,}562$), of whom only 17% were activated Reserve and National Guard members (of these 72% were Army), 68% were white, and 7.2% were women (U.S. Government Accounting Office, 1992; personal communication, Michael Dove, Defense Manpower Data Center). These differences are due primarily to the demographic makeup of the Ft. Deven's troops in general, rather than this cohort specifically.

A total of 2313 of these veterans responded to follow-up questionnaires 12–24 months after the first survey (the mean interval between the two time points was 474 days, with no significant differences between male and female respondents). This corresponds to a response rate of 78% (Wolfe, Brown, & Kelley, 1993). Comparison of veterans who completed follow-up assessments with those who did not showed no differences in age, education, gender, degree of Gulf War combat exposure, PTSD symptoms, or subscales of the Brief Symptom Inventory (described below). However, veterans who completed the follow-up survey were significantly less likely to be on active duty [21.3% vs. 53.8%; $\chi^2(2, N = 2949) = 257.26$, $p < .001$] and were somewhat more likely to be Caucasian than those who did not complete the follow-up [85.6% vs. 72.8%; $\chi^2(3, N = 2949) = 81.2$, $p < .001$]. There was also a significant difference for marital status, although the difference in percentage points was quite small (e.g., 57.5% who completed the follow-up

Table 1. Demographic Characteristics of Soldiers Available at Follow-Up ($N = 2301$): Men Versus Women

	Men ($n = 2108$)	Women ($n = 193$)	
Age [M (SD)]	30.8 (8.9)	28.2 (7.1)	$t(2270) = 3.96^{**}$
Education [M (SD)]	13.1 (1.8)	13.6 (1.9)	$t(2293) = 3.46^{**}$
Military status (%)			$\chi^2(2, N = 2280) = 11.1^{**}$
National Guard	57.5	46.1	
Reserves	21.5	30.6	
Active duty	21.0	23.3	
Race (%)			$\chi^2(3, N = 2301) = 36.3^{**}$
Caucasian	86.7	74.1	
African-American	5.4	15.5	
Hispanic	3.7	3.1	
Other	4.2	7.3	
Marital status (%)			$\chi^2(2, N = 2291) = 52.9^{**}$
Married	59.9	33.2	
Single	33.8	54.4	
Divorced	6.3	12.4	
CES [M (SD)]	6.9 (5.0)	7.1 (4.5)	$t(2303) = -.58$, ns
BSI (GSI)	.51 (.57)	.77 (.75)	$t(2286) = 5.85^{**}$

Note. CES, Combat Exposure Scale; BSI, Brief Symptom Inventory; GSI, Global Severity Index.
$^{*}p < .01$.
$^{**}p < .001$.

survey were married compared to 56.2% who did not). Table 1 lists the demographics of 2301 individuals who had complete data for the main dependent variable in this investigation, according to gender.

Measures and Procedures

All information was obtained by self-report. For the present study, the following information from the initial assessment was used: demographic information, posttraumatic stress disorder (PTSD) symptomatology (Mississippi Scale for Combat-Related PTSD; Keane, Caddell, & Taylor, 1988), degree of combat exposure (Combat Exposure Scale; Gallops, Laufer, & Yager, 1981; Rosenheck, 1992), and physical health problems (the somatic subscale of the Brief Symptom Inventory; Derogatis & Melisaratos, 1983). For the follow-up assessment, physical health problems are reported (subset of the Health Symptom Checklist; Bartone, Ursano, Wright, & Ingraham, 1989).

Mississippi Scale for Combat-Related PTSD (Keane et al., 1988). The Mississippi Scale is a 35-item instrument that yields a continuous score reflective of degree of PTSD symptomatology and has been used to diagnosis presumptive PTSD. Items are rated on a 5-point Likert scale and total scores can range

from 35 (no symptoms) to 175 (most severe symptoms). Scores of 94 or higher have been found to correspond to wartime PTSD diagnoses in community-based veterans from the Vietnam era (Zatzick et al., 1997). The reliability and validity of this instrument have been well documented (Keane et al., 1988; Kulka et al., 1990).

Combat Exposure Scale (CES; Gallops et al., 1981). The original version of the CES consists of 10 items that assess the presence and frequency of a range of typical war-zone stressors. The current version was expanded to include items that describe the unique experiences of the Gulf War (e.g., being on alert for SCUD or biochemical attack; Rosenheck, 1992; Sloan, Arsenault, Hilsenroth, & Harvill, 1995). This new version consists of 33 items rated on a 3-point Likert scale ranging from "never" (0) to "three or more times" (2). The internal consistency (coefficient alpha) for the current sample was .73.

Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983). The BSI is a short form of the Symptom Check List (SCL-90). The 53-item BSI measures symptoms of general psychopathology; scoring algorithms produce a global severity index (GSI) as well as symptom subscale scores. Relevant to the current study is the somatization subscale, which includes the following items: faintness or dizziness, pains in the heart or chest, nausea or upset stomach, trouble getting your breath, hot or cold spells, numbness or tingling in parts of your body, and feeling weak in parts of your body.

Health Symptom Checklist (HSC; Bartone et al., 1989). The HSC is a 20-item self-report instrument designed to assess the presence and frequency of a range of physical and psychological health problems over the "past few weeks." Items are rated on a 4-point Likert scale according to frequency of occurrence (0 = "not at all"; 3 = "very often"). The 20 items were originally drawn from two previously validated scales: 11 items drawn from a scale by Bradburn (1969) and 9 items drawn from the Hopkins Symptoms Checklist (Derogatis et al., 1974). Inspection of the 20 items suggested that the items represented both physical health complaints (assessed primarily by the Bradburn scale items) and more psychosomatic complaints (assessed primarily by the Hopkins Symptoms Checklist). Exploratory factor analysis on the current sample confirmed this hypothesis, with 10 of the 11 items from the Bradburn scale loading on a factor and 8 of the 9 items from the Hopkins Symptoms Checklist loading on a factor (nervous or tense and overly tired/lack of energy loaded on both factors). As we were interested in physical health complaints, a subscale representing physical health symptoms was created by summing across the 10 (nonoverlapping) items from the Bradburn scale. The items were common cold or flu, dizziness, general aches and pains, hands sweat and feel damp and clammy, headaches, muscle twitches or trembling, rapid heartbeat (not exercising), shortness of breath (not exercising), skin rashes, and upset stomach. Internal consistency was quite good in the current sample, coefficient $\alpha = .87$.

Table 2. Prevalence of Health Problems for Men and Women (Endorsed as Occurring "Often" or "Very Often")

Health Problem by Type (%)	Men ($n = 2108$)	Women ($n = 193$)	$\chi^2(1, N = 2301)$
Headaches	17.9	38.9	49.2**
Aches/pains	22.4	30.6	5.9*
Upset stomach	12.5	18.6	5.8*
Cold/flu	12.0	13.0	.69 (ns)
Trembling	9.3	12.4	1.87 (ns)
Rashes	8.5	10.9	1.22 (ns)
Sweaty hands	6.6	9.3	2.04 (ns)
Short of breath	5.8	8.3	2.03 (ns)
Rapid heart rate	5.4	7.8	1.87 (ns)
Dizziness	3.7	7.8	7.8**

Note. $^*p < .01$. $^{**}p < .001$.

Results

As reported in Table 1, 92% of this sample was male ($n = 2108$) and 8% was female ($n = 193$). Statistically significant gender differences were evident for many of the demographic variables: Women were more likely to be younger, serve in the Reserves, be of a minority race, be single, and were more psychologically distressed, compared to men. However, as can be seen, the actual magnitude of differences between men and women was quite small for some of these variables (e.g., education, race).

Table 2 lists the frequencies of individual physical health problems for the sample by gender, endorsed as occurring "often" or "very often" on the HSC. Four of the 10 health problems were endorsed significantly more frequently by women than by men, and no problem was endorsed more frequently by men than by women. The two most commonly reported health problems for both men and women were *headaches* and *aches and pains*. The mean total HSC physical subscale score for men was 4.6 (SD = 4.8) and that for women was 6.1 (SD = 5.2); this is a statistically significant difference [$t(2299) = 4.1$, $p < .001$].

At the time of the initial assessment, women endorsed higher PTSD scores compared to men [M(SD) = 68.1 (16.3) vs. 61.3 (12.8); $t(214.5) = 5.73$, $p < .001$ (equality of variances not assumed)]. Using a previously established cutoff score of 94 for veteran samples (Zatzick et al., 1997), a low percentage of both men and women scored in the range of presumptive PTSD; however, the difference was statistically significant with more women than men achieving caseness [7.8% vs. 2.3%; $\chi^2(1, N = 2313) = 19.83$].

A hierarchical regression was performed to determine the degree to which PTSD symptoms at the initial survey predicted health problems at the follow-up assessment, taking into account the impact of demographic variables, combat

exposure, and health problems at the time of the initial assessment. The interaction between gender and PTSD symptoms was also examined. Results of evaluations of assumptions of normality of error distributions and linearity were satisfactory for all variables. The dependent variable was the total score for the physical subscale of the Health Symptom Checklist; age, race (dichotomized, 0 = nonwhite, 1 = white), marital status (dichotomized, 0 = not married, 1 = married), gender (0 = male, 1 = female), education, and degree of combat exposure (CES total score), were entered simultaneously in the first step; the somatization subscale of the BSI was added in the second step; the third step entered the degree of PTSD symptomatology; and the interaction between PTSD and gender (computed using centered variables) was added last. Military status was not included in this analysis because there was no predictable relation between military status and the variables of interest.

Table 3 reports the correlations between the variables. Table 4 displays the unstandardized regression coefficients (B), the standard error of the regression coefficients (SE B), the standardized regression coefficients (β), the adjusted R^2, and the change in R^2, for each step of the regression. The effects of the demographic variables in step one were significant, accounting for 5% of the variance in the health problems measure. The effect of the measure of physical problems from the initial assessment at step 2 added significantly to the amount of variance explained, accounting for an additional 12% of the variance. After taking these variables into account, the inclusion of PTSD scores from the initial assessment predicted an additional 3% of the variance in step 3, which was a significant difference. The interaction between gender and PTSD scores at step 4, however, was nonsignificant. After all variables had been entered, the effects of PTSD symptoms remained

Table 3. Correlations Among Demographic Variables, Combat Exposure Variable, Initial Health Problems Score, PTSD Score, the Interaction Term of PTSD and Gender, and Health Symptom Checklist Score

	Age	Race	Education	Marital Status	CES	Gender	BSI-SOM	PTSD	PTSD × Gender
Age	1.00								
Race	.02	1.00							
Education	.15**	.03	1.00						
Marital status	.38**	.04	.00	1.00					
CES	−.05*	.02	.16**	−.02	1.00				
Gender	−.08**	−.10**	.08**	−.15**	.01	1.00			
BSI-SOM	−.01	−.01	−.01	.01	.19**	.09**	1.00		
PTSD	−.06*	−.06*	−.08**	−.03	.26**	.14**	.48**	1.00	
PTSD × gender	−.04	.00	.05*	−.02	.02	.34**	.12**	.17**	1.00
HSC	.06*	.02	−.07**	.02	.15**	.09**	.39**	.36**	.06*

Note. CES, Combat Exposure Scale; BSI-SOM, Brief Symptom Inventory—Somatic Subscale; PTSD, posttraumatic stress disorder (Mississippi Scale); HSC, Health Symptom Checklist (Physical Subscale Score).

*$p < .01$.

**$p < .001$.

Table 4. Hierarchical Multiple Regression of Demographic Variables, Combat Exposure, Initial Health Problems, and PTSD Symptomatology on Follow-Up Health Problems

Variable	Step 1. Adjusted $R^2 = .05$**			Step 2. $\Delta R^2 = .12$**			Step 3. $\Delta R^2 = .03$**			Step 4. $\Delta R^2 = .00$, Adjusted $R^2 = .20$		
	B	SE *B*	β	*B*	SE *B*	β	*B*	SE *B*	β	*B*	SE *B*	β
Age	.052	.012	.092**	.051	.012	.092**	.053	.011	.096**	.053	.011	.095**
Race	.345	.283	.025	.376	.264	.027	.492	.259	.035	.501	.259	.036
Education	−.322	.055	−.122**	−.275	.052	−.104**	−.218	.051	−.083**	−.216	.051	−.082**
Marital status	.045	.218	.005	−.058	.203	−.006	−.044	.200	−.005	−.034	.200	−.004
CES	.174	.020	.176**	.102	.019	.103**	.063	.019	.064**	.062	.019	.063**
Gender	1.80	.363	.102**	1.19	.340	.068**	.815	.336	.046*	.948	.354	.054**
BSI-SOM				4.65	.249	.362**	3.52	.273	.274**	3.54	.273	.275**
PTSD							.076	.008	.205**	.077	.008	.208**
PTSD × gender										−.025	.021	−.024

Note. CES, Combat Exposure Scale; BSI-SOM, Brief Symptom Inventory—Somatic Subscale; PTSD, posttraumatic stress disorder (Mississippi Scale).

*$p < .01$.

**$p < .001$.

significant, as did the effects of gender, age, education, degree of combat exposure, and the initial measure of physical health problems. Thus, PTSD symptomatology at the initial assessment was predictive of scores on the physical subscale of the Health Symptom Checklist, even after the effects of demographic variables, combat exposure, and initial levels of health problems were controlled; gender was also a significant predictor of health problems, however, the effect was fairly small.

Examination of the standardized beta coefficients reveals that the direct effects of combat exposure and initial levels of health problems decline after PTSD scores are entered into the equation, suggesting that level of PTSD symptomatology may partially mediate the impact of combat exposure and initial levels of health problems on subsequent health problems.

Given the large discrepancies in sample sizes between men and women, it is conceivable that the relations found between PTSD and health problems were mainly attributable to men and not women. Therefore, regressions were repeated for men and women separately. The original results were supported by these analyses stratified by gender. For men, the standardized regression coefficient for the PTSD score predicting the total health symptom score was .20, after entering demographics, combat exposure, and the initial health problems measure; for women, the standardized regression coefficient for the PTSD score in the same analysis was .21. Therefore, there were no significant differences between men and women on the degree to which PTSD symptomatology at the initial assessment predicted health problems over time.

Discussion

Results of this study provide support for our hypothesis that, among Gulf War veterans, degree of PTSD symptomatology immediately after returning from the Gulf War would be predictive of self-reported health problems 2 years later. Although the association was modest, this relationship held even after demographic variables, degree of combat exposure, and initial levels of health problems were covaried from the analyses. This investigation provides more support for the causal role of PTSD symptoms on health outcome, at least at the level of symptom reporting, and helps strengthen the notion that stressor response, in addition to stressor exposure, contributes to reported health problems.

There are several possible reasons why PTSD could lead to increases in self-reported health problems. For example, there is some evidence that PTSD can lead to neurochemical and physiological changes which affect immunocompetence (e.g., Boscarino, 1996; Friedman & Schnurr, 1995). As such, actual changes in health could occur. PTSD symptoms may also lead to a decline in good health habits and an increase in behaviors that could compromise health, such as alcohol and drug use (Solomon, Mikulincer, & Kotler, 1987). Other possible mechanisms

include decreases in social support (which has been shown to buffer the harmful effects of stress when present) and increases in negative affective states (e.g., depression, hostility, anxiety), all of which have been implicated in poorer health outcomes (Friedman & Schnurr, 1995). Additional research is needed to explore further the specific pathways which link PTSD symptomatology to declines in reported physical health, as well as to ascertain whether changes can be objectively corroborated (e.g., by laboratory data, physician diagnoses).

Some support was also found for our second hypothesis, that female veterans would report more health problems than male veterans 2 years after returning from the Gulf War. This finding is consistent with previous studies which have found that women report more health problems than men in the general U.S. population (e.g., Kroenke & Spitzer, 1998; Verbrugge, 1985, 1989). One possibility is that women are in fact at greater risk for developing certain health problems compared to men. An alternative, but compatible explanation is that women may be more likely to report observations of health problems or to detect them, compared to men (Verbrugge, 1985). It is also possible that the measure of health problems used in this study was more sensitive to symptoms experienced by women than men. Future research using rigorous and more comprehensive surveys of health problems as well as concurrent interviews and medical examinations would help clarify these questions.

The third focus of this study was to investigate the role of gender in the relationship between PTSD and health problems. Although we made no specific predictions, gender did not impact the relationship between PTSD and health outcome, based on both interaction and stratified analyses. In this sample, then, there were no differences between men and women on the degree to which PTSD symptomatology predicted reported health problems.

One explanation is that gender per se may not moderate the relationship between PTSD and health problems, but instead, other factors which frequently cooccur with gender, such as the type of stressor experienced or physical fitness, are related. In this sample of relatively physically fit Gulf War veterans, men and women were likely to be more comparable on these variables than samples of civilian men and women which may have contributed to the failure to find an effect of gender. Moderating effects of gender might be more readily found in civilian populations where background stressor experiences and physical status vary more widely. It should be noted that this study did find higher rates of PTSD among women than men immediately after their return from the Gulf. Thus, women may be more susceptible to PTSD than men (or may experience a wider range of stressors than men), and this may explain the higher rates of health problems also found among women. Indeed, the scale used to assess stressor exposure in the current study did not include experiences that might be predominantly experienced by women, such as sexual harassment or assault (Wolfe et al., 1998). Finally, although this study included a moderate number of female veterans (in comparison

to previous studies), the sample sizes of men and women in the current study were quite disparate. The heterogeneity of variance between groups may have affected the gender-based analyses, and results should therefore be interpreted with caution.

One limitation of the current study is that the Health Symptom Checklist was not administered at the initial survey. The somatization subscale of the Brief Symptom Inventory was used in an effort to control for initial levels of health problems. Although the two measures are highly correlated (e.g., the correlation between these measures obtained at the follow-up survey was .79), and 50% of the items on the somatization subscale of the BSI were the same as items on the HSC, the measures are not identical. Thus, it could be argued that the relationship between PTSD at the initial survey and health problems at follow-up is attributable to initial rates of health problems as measured by the Health Symptom Checklist. Future longitudinal studies utilizing identical measures of health problems over time are needed to address this issue.

There are additional limitations of the current study that potentially affect the generalizability of the results. The generalizability of veterans to civilians is unknown. Also, this was primarily a young sample and results may be different for different age groups and for people with different degrees of physical fitness (Ballweg & Li, 1989). Among veterans, the veterans who completed the survey for this study were less likely to be on active duty compared to those who did not complete the survey. Thus, results may not be generalizable to all veterans, especially those who remain on active duty. In fact, poorer health status could be associated with veterans' decision to leave active duty. Finally, the measure of health problems in this study was brief, assessed only a small set of possible health problems, and relied exclusively on self-report. As with any self-report measure, resulting data can be influenced by a number of factors including memory, social desirability, attention, and current mood (Cook & Campbell, 1979; King & King, 1991). Hence, our findings on PTSD symptomatology and health problems should both be viewed in this context.

Still, this study provides support for the hypothesis that PTSD symptoms predict perceived health problems. It builds on previous research of the association between health problems and PTSD by examining health problems over time, utilizing a large sample size, and including female veterans. Next, we must strive to understand the range of health problems that relate to PTSD as well as the specific ways in which PTSD symptoms are linked to health outcomes. Such knowledge is crucial to the development of early interventions aimed at ameliorating stress and stress-associated health problems.

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